

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Calvin F. QUATE et al.

Examiner: TBD

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Group Art Unit: TBD

Filing Date: (Herewith)

Title: METHOD FOR DETECTING CHEMICAL INTERACTIONS BETWEEN  
NATURALLY OCCURRING BIOLOGICAL ANALYTE MOLECULES  
(AS AMENDED)

PRELIMINARY AMENDMENT

Commissioner for Patents  
Washington, D.C. 20231

Sir:

Prior to examination of the above-referenced application, please enter the following amendments and remarks.

In the Title:

Please amend the title as follows:

-- METHOD FOR DETECTING CHEMICAL INTERACTIONS BETWEEN  
NATURALLY OCCURRING BIOLOGICAL ANALYTE MOLECULES --.

In the Specification:

On page 6, line 21, please insert:

-- BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 illustrates the surface of a cantilever prepared to attach strands of DNA according to one embodiment of the invention;

Fig. 2 shows the cantilever of Fig. 1 mounted in a liquid cell containing an aqueous buffer;

Fig. 3 illustrates the cantilever of Figs. 1 and 2 with sample analyte molecules hybridized with strands of DNA on the cantilever; and

Fig. 4 shows another embodiment of the invention employing two cantilevers. --

In the Claims:

Kindly cancel claims 2 - 13 without prejudice or disclaimer.

Please add new claims 14 - 31 as follows:

14. (New) A method of detecting the interaction between naturally occurring biopolymers comprising:

providing a gold support;

preparing a self assembled surface on the gold comprising alkanethiol molecules;

preparing the surface with a biopolymer;

introducing at least one bio-polymer analyte molecule to said surface; and

detecting a change based on binding between the biopolymer and the biopolymer analyte.

15. (New) A method as claimed in claim 14 wherein said bio-polymer analyte molecules are DNA.

16. (New) The method of claim 14 wherein said bio-polymer analyte molecules are oligonucleotides, polynucleotides, or polyamino acids.

17. (New) The method of claim 14 wherein said interaction is a non-covalent interaction.

18. (New) A method of detecting the occurrence of a chemical interaction between naturally occurring bio-polymers which are non-identical binding partners comprising:

providing a gold support;

preparing a self assembled surface on the gold comprising alkanethiol molecules;

preparing the surface with a first biopolymer material which can act as a binding partner to a second bio-polymer material;

introducing said second biopolymer material; and

detecting a change based on binding between the first biopolymer material and the second biopolymer material.

19. (New) A method in accordance with claim 18 wherein the first biopolymer material is a polynucleotide.

20. (New) A method in accordance with claim 18 wherein the second biopolymer material is a polynucleotide.

21. (New) A method of detecting the chemical interaction between naturally occurring bio-polymers comprising:

providing a gold support;

preparing a self assembled polymeric surface on the gold;

preparing the surface with a biopolymer;

introducing at least one bio-polymer analyte molecule to said surface; and

detecting a change based on binding between the biopolymer and the biopolymer analyte.

22. (New) A method in accordance with claim 21 wherein the biopolymer material is a polynucleotide.

23. (New) A method of electronically sensing the interaction between polynucleotide comprising:

providing a gold support;

preparing a self assembled surface on the gold comprising alkanethiol molecules;

preparing the surface with a polynucleotide;

contacting at least one polynucleotide analyte molecule to said surface; and

detecting an electrochemical change based on binding between the polynucleotide and the polynucleotide analyte.

24. (New) The method of claim 23 wherein the sensing occurs without modifying the analyte or the polynucleotide.

25. (New) The method of claim 23 wherein the sensing is for biomedical or environmental applications.

26. (New) The method of claim 23 wherein there is a plurality of polynucleotides to form an array.

27. (New) A sensor apparatus for detecting binding between non identical biopolymers; comprising:

a gold support;

a self assembled surface on the gold comprising alkanethiol molecules;

a biopolymer operably connected to the self assembled surface; and

a detector for determining binding between the biopolymer and the biopolymer analyte.

28. (New) The sensor in accordance with claim 27, wherein the biopolymer is an oligonucleotide, polynucleotide, or polyamino acid.

29. (New) The sensor in accordance with claim 27, wherein the biopolymer analyte is an oligonucleotide, polynucleotide, or polyamino acid.

30. (New) The sensor in accordance with claim 27, wherein the biopolymer and the biopolymer analyte are oligonucleotides, polynucleotides, or polyamino acids.

31. (New) The sensor in accordance with claim 27, wherein the sensor is arranged to produce an array.

#### **A. REMARKS**

Applicants respectfully ask for entry and consideration of this Amendment, which applicants believe contains no new subject matter. The “Brief Description of the Drawings” portion of this amendment presents no new matter, as those drawings are each described in the text of the specification.

New claims 14 - 31 are presented in this amendment in order to more fully claim the features of the invention. Support for these new claims is found throughout the specification. For example, specific support for independent claim 14 is found at page 3, lines 10-14 (gold support); page 3, lines 10-13 (self-assembled surface on the gold comprising alkanethiol molecules); page 5, line 26, and page 6 lines 2-3, (preparing the surface with a biopolymer); page 6, line 24 (introducing at least one biopolymer analyte molecule to said surface); and page 5, lines 4-11 and page 7, lines 11-15 and lines 17-37 (detecting a change based on binding between the biopolymer and the biopolymer analyte). Support for dependent claim 15 (said biopolymer analyte molecules are DNA) is found specifically at, for example, page

8, lines 8-11. Support for dependent claim 16 (oligonucleotides, polynucleotides, or polyamino acids) is found at page 1, lines 23-29, and throughout the remainder of the specification. Support for dependent claim 17 (non-covalent interaction) is found throughout the specification. See, for example, page 7, lines 31-34.

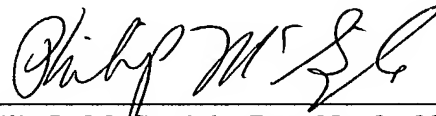
Support for the remaining independent claims (18, 21, 23, and 27) can also be found throughout the specification, especially in the locations noted above for independent claim 14. The remaining dependent claims are also supported throughout the specification.

Applicants await examination on the merits.

Respectfully submitted,

January <sup>29</sup>~~30~~, 2002

By:



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Title:

Please amend the title as follows:

-- METHOD FOR DETECTING CHEMICAL INTERACTIONS BETWEEN  
NATURALLY OCCURRING [BIO-POLYMERS WHICH] BIOLOGICAL ANALYTE  
MOLECULES [ARE NON-IDENTICAL BINDING PARTNERS] --.

In the Specification:

On page 6, line 21, please insert:

-- BRIEF DESCRIPTION OF THE DRAWINGS

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preparing a self assembled surface on the gold comprising alkanethiol molecules;  
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introducing at least one bio-polymer analyte molecule to said surface; and  
detecting a change based on binding between the biopolymer and the biopolymer  
analyte.

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24. (New) The method of claim 23 wherein the sensing occurs without modifying the analyte or the polynucleotide.

25. (New) The method of claim 23 wherein the sensing is for biomedical or environmental applications.

26. (New) The method of claim 23 wherein there is a plurality of polynucleotides to form an array.

27. (New) A sensor apparatus for detecting binding between non identical biopolymers; comprising:
- a gold support;
  - a self assembled surface on the gold comprising alkanethiol molecules;
  - a biopolymer operably connected to the self assembled surface; and
  - a detector for determining binding between the biopolymer and the biopolymer analyte.
28. (New) The sensor in accordance with claim 27, wherein the biopolymer is an oligonucleotide, polynucleotide, or polyamino acid.
29. (New) The sensor in accordance with claim 27, wherein the biopolymer analyte is an oligonucleotide, polynucleotide, or polyamino acid.
30. (New) The sensor in accordance with claim 27, wherein the biopolymer and the biopolymer analyte are oligonucleotides, polynucleotides, or polyamino acids.
31. (New) The sensor in accordance with claim 27, wherein the sensor is arranged to produce an array.

FIG. 1

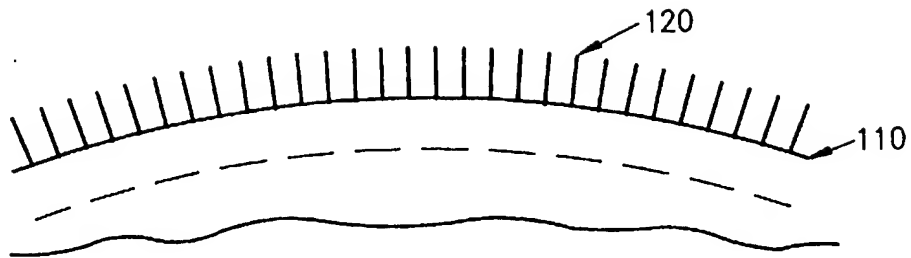


FIG. 2

